

# JBOX AJB-X

## ANALOG JUNCTION BOX FOR STRAIN GAUGE LOAD CELLS

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## 1. INTRODUCTION

JBOX AJB-4/6 is a summing box designed for the parallel connection of analog load cells. It contains the wire terminals for 4 or 6 strain gauge load cells, surge arresters and corner trimming circuits. The load cell connectors are 4-wire, while the indicator connector is 6-wire. Corner trimming may be done by resistor(s) or potentiometers in series with the signal lines. Resistance is added to the +sig line, by removing copper track short-circuits next to the component(s). The unit is suitable for all weighing applications or force measuring strain gauge transducers. The enclosure has been designed for use in industrial environments and is EMC safe to EN 45501 standards. Two enclosure variants are offered, a four input version for low profile scales and a six input version for bigger scales.

The cables enter the box via IP67 cable glands.

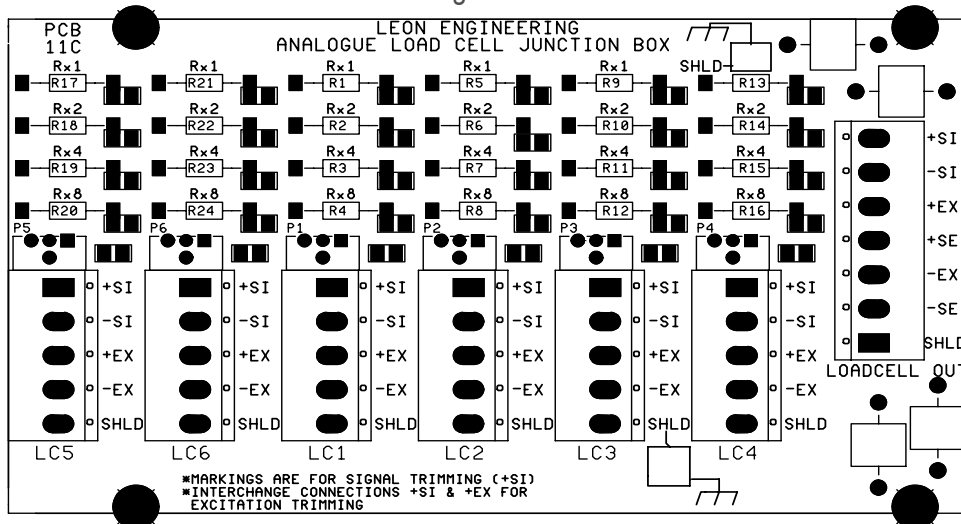
The connectors are marked LC1 to LC6, corresponding to load cell 1 to 6.

The connector for the indicator cable is marked LOAD CELL OUT.

Load cell connectors are marked as follows:

+Ex = Excitation positive	+Se = Sense positive	+Si = Signal positive
-Ex = Excitation negative	-Se = Sense negative	-Si = Signal negative

The excitation and sense terminals are connected together on the LOAD CELL OUT connector.



## OPTIONS

OP.1 JBOX AJB-4/6TM Analog Junction Box Technical manual.

## 2. HARDWARE – INSTALLATION

Normally JBOX AJB-4/6 comes in a sealed stainless steel enclosure, suitable for wash down environment. Entry of connecting cable is through sealed cable glands.

### 2.1. Mounting

The mounting location should be such that the unit is not subject to excessive vibrations or heat.

Select the right location based on environmental conditions NOT on the ease of installation.

Provide dripping loop on cables to avoid liquids entering the cable glands.

The top panel should be accessible.

## 2.2. Wiring

Remove the lid by undoing the four screws. Insert cables via the cable glands. Strip the cables and connect the load cells to respective connectors. If the load cell cables are 6-wire connect together the excitation and sense leads (+Ex with +Sen) and (-Ex with -Sen).

Connect the shields of the cables on SHLD terminal or directly on the chassis screws using eyelet terminals. Connect the earth wire (6-10mm multistrand) on the external M4 screw and tighten the butterfly nut.

When wiring is completed pull out any excessive cable and tighten the cable glands to ensure a firm grip on the cables. Re-install the lid and tighten the screws until the side edges are recessed 2mm from the lid edges.

*For optimum EMC performance keep the length of the shield inside the enclosure as short as possible.*

## 2.3. Earth - Shield

Normally the shield is floating on the JBOX AJB side and connected on the indicator side.

Where the maximum of protection must be provided for the load cells and the electronics, the shield may be connected to earth by bridging the two solder pads on the surge arrester side SGAP4 and next to LC4 connector.

**CAUTION :** *Do not run load cell cables together with power cables.  
Connect the shielding where indicated on the drawing only.  
Never use a megger to check wiring.  
Never use insulating tape on load cell connections.*

## **3. CORNER ADJUSTMENT**

This is the procedure where the output of each load cell is corrected so that the weight indication will be the same wherever the load is placed on the platform. Corner adjustment must be performed before calibration of the scale. All load cells should be levelled and load distribution equal before trimming the outputs.

The corner adjustment is performed by successively placing a test weight on each quadrant of the platform and trimming the higher indicating corners until all indications are the same.

Because the load cells are summed the corners interact with each other and any adjustment will affect all corner indications. Prior to corner trimming the indicator must have been connected and an approximate calibration performed.

The principle of trimming is "CURRENT CALIBRATION" where the load cells are rationalised in terms of current output into the common resistance.

Four resistors 0.33R (Rx1), 0.68R (Rx2), 1.3R (Rx4), 2.7R (Rx8) and 1 potentiometer (20R) are available for each load cell terminal. By removing copper track short-circuits next to the component(s) resistance is added to the +sig line.

### 3.1. Pre-trimming

Because corner trimming is a tedious and time consuming operation, "PRE-TRIMMING" should be exercised if the load cell data are known.

Measure the output resistance  $R_{out}$  of each load cell using a 4.1/2 digit multi meter.

Calculate the Iout of each load cell :  $I_{out} = V_{out} / R_{out}$ .

The lower value  $I_{ref}$  is the reference load cell which is not trimmed. Add series resistance on the signal lines of the remaining load cells so that the current out matches the reference one.

The incremental resistance may be calculated by  $R_i = (V_{out} / I_{ref}) - R_{out}$ .

### 3.2. Resistor trimming

The corner adjustment is performed by successively placing a test weight, (0.4Max), on each quadrant of the platform and trimming the higher indicating corners until all indications are the same.

The value of the incremental correction resistance may be calculated by :  $R_i = [ (I_c - I_l) / I_l ] * R_{out}$  where:  $I_c$ = Corner indication,  $I_l$ = the lower corner indication,  $R_{out}$ = Load cell's output resistance .

### 3.3. Potentiometer trimming

The corner adjustment is performed by successively placing a test weight, (0.4Max), on each quadrant of the platform and trimming the higher indicating corners until all indications are the same.

- Turn all potentiometers on PCB 11C clockwise ( $R_i=0$ ).
- Place the test weight at each of the designated corners (centre of each quadrant). Record the displayed indications. The load cell with the lowest indication is not trimmed.
- Place the test weight at each corner in sequence .Adjust the potentiometer corresponding to that location to obtain the “non trimmed” indication.
- Repeat the procedure until all indications are the same.

The default principle used in JBOX AJB-4/6 is signal trimming which has negligible effect on span stability but some effect on zero temperature stability, as only one side of the bridge is trimmed.

Excitation trim is sometimes preferred, despite the span effect, as the overall performance looks more stable in temperature changes.

To perform excitation trimming simply interchange +EX and +SIG connections as shown in the following table.

LOAD CELL CABLE	LOAD CELL CONNECTOR(JB)	INDICATOR CABLE	INDICATOR CONNECTOR(JB)
+Exc	+SI	+Exc	+SI
-Exc	-EX	+Sen	+SI
+Sig	+EX	+Sig	+EX
-Sig	-SI	-Sig	-SI
		-Sen	-SE
		-Exc	-EX

## **4. TROUBLESHOOTING**

A warming up of at least 15 minutes for the load cell is recommended before calibration of a weighing system.

SYMPTOMS	ACTION TO BE TAKEN
Calibration does not proceed.	Check load cells connected and setup parameters of indicator. Place a test weight on each load cell and verify that there is a positive change in indication. Use calibration weight equal to 10-30% of each load cell capacity. Check load cell connector screw terminals (if not tight push with a tool from the opposite side of the screw).
Weight indication	Check calibration data. Reduce external divisions or lower conversion rate is not stable. Or increase digital filter, check number of load cells. Check power supply, check load cell connection(s) and cable(s). Check input and output resistance and resistance between any terminal and shield. If they deviate from the original values it is an indication of a bad

	<p>electrical circuit.          Check that the scale is mechanically OK and it is free on all sides.          Check whether moisture has entered the junction box.          Check if corrosion has degraded load cell performance.          Check shock resistance by lightly rapping on the load cell with a small mallet.</p>
Weight indication is not the same on each corner.	<p>Check that the scale is mechanically OK and it is free on all sides.          Check load cell connection(s) and cable(s). Check input and output resistance and resistance between any terminal and shield.          Adjust the corners and recalibrate.</p>

## 5. SPECIFICATIONS – MAINTENANCE

### 5.1. Technical specifications

EMC COMPATIBILITY	Compliant to EN 45501 standards
CABLE FITTINGS	Cable glands PG9 (acceptable cable diameter 3 – 9 mm)
CONNECTORS	Screw terminals
TRIMMING	Current calibration principle with resistor(s) (Max 5R totally) Or potentiometer (Max 20R)
CIRCUIT BOARD	Double sided plated through, FR4 (103x82x20mm)
SURGE PROTECTION	90V clamp - Withstands up to 20kV and up to 10kA

### 5.2. Environmental considerations

AMBIENT TEMPERATURE	Storage	-10 to +70 0C
	Operating	-10 to +40 0C
HUMIDITY		40 to 90% RH (non condensing)
VIBRATION		Severe vibration can affect the accuracy of weighing and damage electric / electronic components.
AIR		The surrounding air should not contain any corrosive gasses or materials which could adversely affect the equipment.
PROTECTION		IP67
ELECTROMAGNETIC		Heavy electrical equipment should not be installed close to FIELDS the weighing equipment.
INCOMING AND OUTGOING SIGNALS		Relays and contactors connected to the equipment must have reliable and effective interference suppression. This also applies to other equipment located within a distance of 3m from the equipment. Cabling must be performed according to normal practice.
NOTES		-WELDING on or in the vicinity of the equipment is strictly prohibited. -STATIC loads, caused by thunderstorms, have to be prevented from developing by use of reliable lightning conductors. -ENSURE that the cooling of the equipment is not obstructed.

### 5.3. Maintenance

The unit does not require any routine maintenance. It may be necessary to perform periodic check of the calibration of the scale due to mechanical reasons. The frequency of the calibration checks depends on the application condition and on the required measuring accuracy.

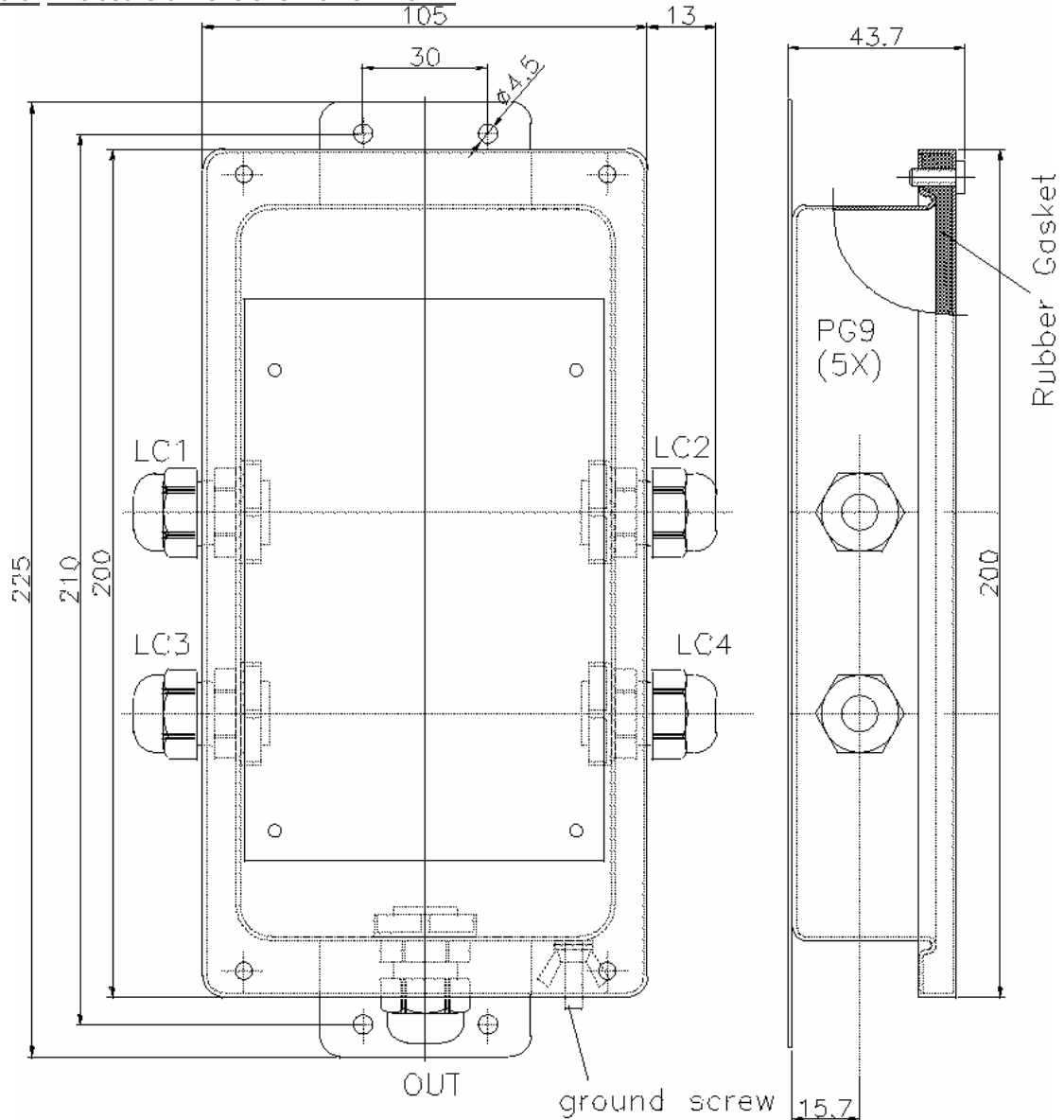
### 5.4. Service

There are no serviceable parts. The unit may be repaired by trained service personnel only. The user may check load cell connections and power supply.

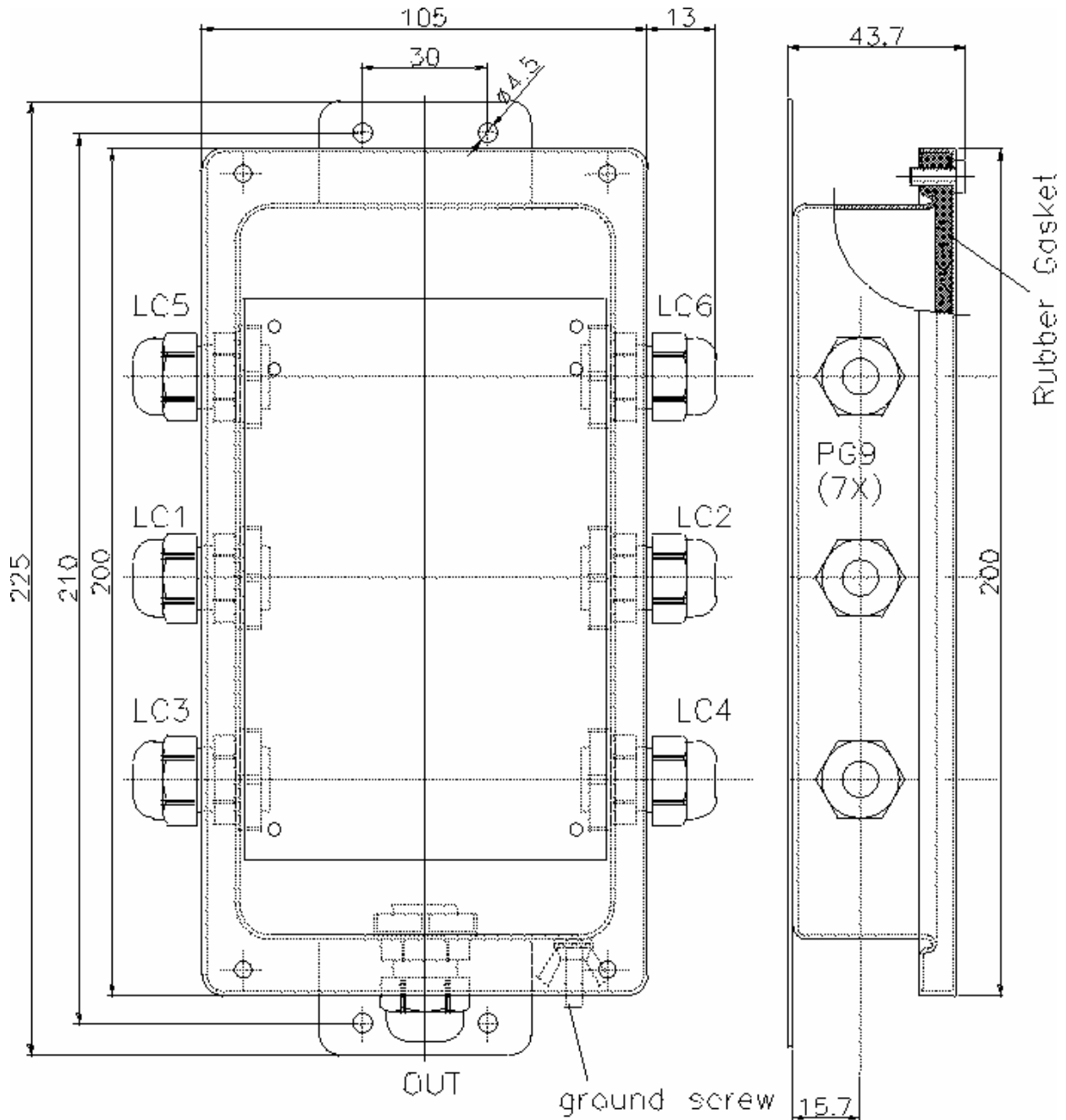
### LOADCELLS

Load cells are reliable and very rarely present errors. Check input and output resistance, and resistance between any terminal and shield. Check load cell connection and cable.

### 5.5. Enclosure dimensions – JBOX AJB 4



5.6. Enclosure dimensions – JBOX AJB 6



## **6. LOAD CELL COLOUR CODE**

Please, refer to control datasheet delivered with every load cell : only this data sheet should be considered.

TYPE OF CABLE	INPUT	OUTPUT		INPUT
	+EXC	+SIG	-SIG	-EXC
PVC	BROWN	GREEN	WHITE	YELLOW
TEFZEL	RED	BLUE or GREEN	WHITE	BLACK

### *Notes :*

1. Unidirectional load cells (Compression only or Tension only) – Positive output in the direction of the load.
2. Universal load cells (Compression or Tension) – Positive output in the direction of compression loading.
3. To correct the weight reading in the wrong direction, reverse the output (signal) polarity.